PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in, or relating to, Extrusion or Injection Moulding Presses and other Apparatus comprising a Heated Cylinder

I, NEVILLE WALLACE GILBERT, a British Subject, of B. & Y. Works, Rushey Lane, Tyseley, Birmingham 11, do hereby declare the inventian, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention has reference to extrusion or injection moulding presses and other apparatus, such as calenders, rollers, air receivers, water pipes, and the like of the kind comprising a cylinder or tube which is heated when the apparatus is in use.

It is common practice to heat such cylindrical apparatus electrically, more usually by passing a current through a coiled resistance unit disposed around the cylinder, so as to heat the cylinder by radiation and/or conduction of heat for the said unit; as a consequence, the generated heat has to be conducted through the cylinder wall before it may be applied usefully. However, it has been proposed to construct the cylinder of an injection moulding press from magnetisable material such as steel, so that it may be heated by an oscillating magnetic flux induced in the said material by the passage of an alternating current through one or more coils each consisting of a plurality of concentric windings disposed around the cylinder and enclosed in a two piece shell or casing which is also made of magnetisable material and is clamped around the said cylinder.

The principal object of the present invention is to provide improved apparatus of simple and economical construction, which is capable of being heated to a controlled and predetermined temperature by induced oscillating magnetic flux, quickly, easily and efficiently.

Further objects of the invention are to enable the electrically generated heat to be concentrated at any desired locality of a heating cylinder without creating steep temperature gradients between the inner and outer surfaces of the cylinder, thereby minimising stresses within the cylinder material.

In accordance with the said invention, the cylinder or tube of an extrusion or injection moulding press or other apparatus of the kind hereinbefore referred to, is made of steel or other magnetisable material, and a plurality of induction units are asembled to and around and concentrically of the cylinder or tube, each of the said units consisting of a single multi-turn coil or winding of electrically insulated conductor, the said coil or winding being protected by a heat resisting sheath or covering enclosed in a mganetisable shell having an open end which abuts against and is closed by the closed end of the next successive unit or a component of the apparatus, and having an open side which seats upon and is closed by the external periphery of the cylinder or tube so that the said shells and the cylinder or tube are included in closed magnetic loops or paths which pass through the eyes of the coils or windings.

In order that the invention may be more readily understood and carried into practice, reference will now be made to the accompanying drawings, wherein:—

Figure 1 is a diagrammatic sectional elevation of an injection moulding press.

Figure 2 is a similar view of an alternative or modified injection moulding press.

The injection moulding press illustrated in Figure 1 comprises a steel or cast iron working cylinder 1 of which the end 2 into which the material to be heated and moulded is adapted to be supplied, has an annular flange 1^a which is also made of steel or cast iron, assembled around its external periphery, the opposite end of the said cylinder being provided with a nozzle 3 of any known and suitable kind.

The cylinder is surrounded by three induction units arranged end-to-end along the length of the said cylinder, each unit consisting of a single multi-turn coil or winding 4 of insulated wire concentric to the cylinder, and an annular steel or cast iron shell 5 between which and the exterior of the cylinder, the coil is enclosed. One end of the shell is formed with an internal

of turns in the coils of the remaining units so that selected axial zones of the cylinder or tube may be heated to different predetermined temperatures.

7. Apparatus as claimed in Claim 4, wherein the heat generated by the several units is controlled by a single thermostat.

8. Cylindrical apparatus constructed, arranged and adapted to operate substantially as herein described with reference to the accompanying drawings.

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PROVISIONAL SPECIFICATION

Improvements in, or relating to, Extrusion or Injection Moulding Presses

I, NEVILLE WALLACE GILBERT, a British Subject, of B. & Y. Works, Rushey Lane, Tyseley, Birmingham 11, do hereby declare this invention, to be described in the following statement:—

This invention has reference to extrusion presses or injection moulding presses of the kind wherein the material to be extruded or moulded is heated to a plastic condition in a tube having a nozzle or die through which the said material is forced.

The principal object of the present invention is to provide a new or improved press, of simple and economical construction, which is capable of heating the material undergoing treatment speedily to a controlled pretermined temperature and with a high degree of efficiency.

In accordance with the said invention, a press comprises a tube which is made of steel or similar magnetisable material, and one or more induction units for heating the contents of the tube.

Preferably each induction unit comprises a coil, containing a predetermined number of turns, which is disposed around the tube and is itself enclosed in a steel or like shell forming, with the tube, a magnetic path or loop which passes through the eye of the coil. Thus, upon passing an electric current through the coil from any suitable source of supply, heating currents are induced in the tube.

A plurality of induction units may be disposed around the tube, the coil of each unit being connected, independently of the coils of the remaining units, to the source of current supply and the heat generated in the tube by each unit being controlled by a separate thermostat. Alternatively, the coils of the several units may be wound in series.

When more than one coil is provided, the number of turns in the individual coils may be successively reduced towards the nozzle or discharge end of the tube, and the heat imparted to material within the tube may be controlled by a single thermostat.

In a typical application of the invention, in its simplest form, to an extrusion or injection moulding press, the tube is formed, externally of its end into which the material to be heated is supplied, with an integral peripheral flange, the opposite end of the tube being of nozzle form as is known practice. A coil, consisting of a predetermined number of turns of an electrically insulated conductor, is wound around, or superimposed upon and around, the outside of the tube, the said coil enclosing the whole or the major portion of the length of the tube between the flange and nozzle. The conductor is insulated by any suitable insulating material which is capable of withstanding high temperatures without appreciable deterioration, for example, by glass or mica bonded or sealed with an insulating varnish such as silicone.

The coil is surrounded by a shell having an internal diameter sufficient to enable it to be passed over the coil until its one end seats against the tube flange; the other end of the shell is formed with an internal shoulder which contacts the tube around the periphery of the latter to complete a magnetic loop or path along the wall of the tube, the internal shoulder of the shell, the wall of the latter and the tube flange. The tube, shell and coil thus forms a single induction unit which is clamped upon the tube by a nut applied to the nozzle end of the tube. If desired, the nut may form part of the magnetic path or loop. Alternatively, instead of forming the shell with an internal shoulder, a flat disc may be applied to one end thereof, and, instead of providing the flange around the supply end of the tube, the said flange may be provided at, or in the vicinity of the nozzle in which case the induction unit or units are clamped in position by a nut applied to the said supply end.

By passing an alternating current through the coil, a magnetic field is produced in the said path or loop, the direction of flow of the field being repeatedly changed at a frequency equal to the frequency of the alternating current. As a consequence, eddy and hysteresis currents are circulated in the shell and tube and the latter is heated rapidly to a predetermined temperature. The heating of the tube heats the powder or other material fed into its flanged end, to a plastic condition preparatory to extrusion through the nozzle in any known and convenient manner. A thermostat is provided for controlling the temperature to which the tube is heated.

In an alternative application of the invention, tw or more shell-enclosed coils are provided on and along the length of the tube, the shells encosing adjacent coils being in abutment one with the other to create a closed magnetic path or loop around each of the said coils. Each coil is connected, independently of the others, to a suitable supply of alternating current and a thermostat is associated with each coil or induction unit to control the tube temperature.

It is desirable that the flanged end of the tube, in which the material to be heated has to be raised from atmospheric temperature, should have a greater heat loading than the remainder of the tube; also that the heat loading should decrease gradually towards the nozzle. This graduated heat loading may be obtained by providing a plurality of induction units wherein the number of turns in the successive coils is reduced from the flanged to the nozzle end of the tube.

In still another application of the invention whereby this graduation of heat loading is obtained, a plurality of induction units, preferably three, are provided on the tube. The units are arranged in abutting end-to-end relationship and the coils of the units, which consist successively from the flanged end to the nozzle end of the tube, of a lower number of turns of insulated conductor, are connected in electrical series. The temperature generated in the several zones of the tube within the said coils, is controlled by a single thermostat which is embedded in or clamped on the surface of the tube and extends into the interior of all the coils, and the said zones are graded to give optimum heat distribution along the length of the tube.

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772,424 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

FIG.1.

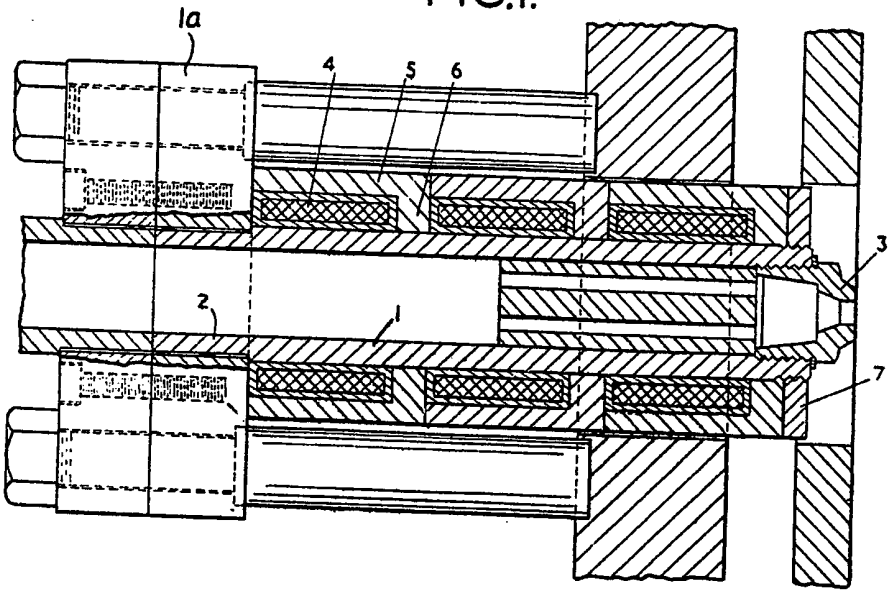

FIG2.